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Rimers and drills of the usual forms are found, though not in great numbers. Most of the perforations found in various specimens, as banner stones and tubes, were not made by means of flint drills, but by sticks of wood, or perhaps hollow reeds and sand, or some such process.

Spear, lance and arrow points are of course more abundant than any other class of specimens, and all the varieties figured by Col. Foster are found, with others differing from these. Some very singular inequilateral forms occur, like those figured by Prof. Haldeman in a recent number of the NATURALIST, and many others. Indeed a close examination of any large collection of flint points, will show that entirely symmetrical forms were rarely attained; by far the larger part are more or less unequal, both as regards curvature or straightness of the edge and convexity of the surfaces. One edge is usually more strongly curved than the other, and one surface more convex than the other. Often the blade is not in the same plane with the stem, but seems twisted upon it, due, as I think, less to the intention of the maker than to the fracture of the stone. From these slightly, often almost imperceptibly, unequal points, we have every gradation to those which are nearly as unsymmetrical as possible, and of these latter, some are so well chipped that I cannot regard them as "failures," but for some unknown reason intentionally of the form we find them. In comparing the specimens from the Champlain valley with those from Georgia, figured by Mr. Jones, I have been struck with the close resemblance between them; there are comparatively few of the objects described in "Antiquities of the Southern Indians," which cannot be duplicated, often exactly, in Vermont specimens. This resemblance is more noticeable because among Dr. Abbott's New Jersey specimens I find many unlike those which we have with us.

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THE ORIGIN OF THE DOMESTIC ANIMALS.

BY G. DE MORTILLET.[1]

WE know that the men who lived in our region during the long quaternary, or paleolithic period, were autochthones. We have seen that they developed slowly, regularly, in a progressive, continuous manner, both from a physical as well as an industrial point of view, from the beginning of the quaternary up to the present (actuelle), or neolithic epoch. During all this vast lapse of time nothing happened to interrupt the two-fold, ascending, progressive movement; nothing has seemed to disturb it. No new element has been suddenly added. This movement has, then, operated in the local, autochthonous population without intrusion and mixture of foreign populations.

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[1] Translated from Materiaux pour l'Histoire primitive et naturelle de l'Homme, 1879. 4e et 5e livraisons.

At the beginning of the present epoch, on the contrary, we see all at once a new civilization introduced without transitional steps. The neolithic, or polished-stone, industry, to which I have given the name of *Robenhausienne,* appeared all at once without the least gradation, and at the same time we find a new human type, the brachycephalic type. There was here an invasion. A population from abroad brought here all at once not only the polished hatchet, which is only a single fact, but also, and what is especially noteworthy, pottery, domestic animals, the cereals, monuments, dolmens and menhirs, and finally, religious ideas, the worship of the dead. All this was completely unknown to the autochthonous population of geological times, to the paleolithic people. We see that with the polished hatchet appeared six domestic animals, the dog, goat, sheep, ox, horse and pig; three cereals, wheat, barley and rye, accompanied by a textile plant, the flax. It is evident that there took place an industrial revolution which corresponds to that produced in America by the arrival of the Europeans. It is incontestably the fact that here was a great invasion—great at least from the point of view of the results produced. It was the first which took place in Western Europe.

Whence did this invasion come? The study of the domestic animals may tell us. We need not urge the case of the dog, which may have preceded the arrival of the invaders. Indeed, it is the animal the most anciently and completely domesticated. Of all the domestic animals, it is the only one which man has not been obliged to care for and watch. We may say, on the contrary, that he watches man. Very valuable from the two-fold point of view of personal necessity and of the chase, it was held in high esteem by the savage and nomadic peoples who were always on the *qui vive* and lived only by the products of the chase. In fact, the dog is, in our day, quite what he was among the people who had no other domestic animals. We may now say some words as to his origin.

Some authors have derived the dog from the fox. This view is not probable, because there exists in the fox a particular disposition which is not found in dogs.

It is said also that the dog has descended from the wolf or jackal. This is possible, but is not probable; wolves and jackals do not voluntarily breed with dogs.

We meet in the quaternary beds and deposits of France with the remains of a species of Canidæ more nearly allied to the domestic dog than to the wolf or fox. But these remains are rare, wholly exceptional in our region. If this canid has given origin to some one of our domestic dogs, which is possible, this could not have occurred in our country. This event happened when the quaternary canid was in its own country, where it abounded and lived in continual contact with man.

Among savage animals which may have given origin to the domestic dog are found the *colson* and *buansu*, veritable wild dogs. They actually inhabit the regions of India situated between the Lower Himalaya and the coast of Coromandel. They are perhaps the emigrated descendants of the quaternary canid of which I shall speak presently, and indeed they have close osteological resemblances.

Our actual races of dogs are so numerous, so varied in form, so different that very probably they have had different origins. Certainly there is one which has come from the *cabéru*, the wild dog of Abyssinia, which has been found as far as the center of Africa. Certainly one of the oldest races of dogs in Egypt is the domesticated *cabéru*. Indeed, on the Egyptian pictures which go back to the remotest periods, to the fourth and even to the third dynasty, that is to say from 3000 to 4000 years before our era, we have seen certain large greyhounds. Indeed, the *cabéru* is extremely near the greyhound.

But we will not speak farther of the dog. The five other domestic animals which we have seen to have appeared in Western Europe contemporaneously with the polished hatchet and with pottery are, the horse, ox, goat, sheep and pig.

Since all the animals have had quaternary ancestors in our region, they have therefore been supposed to have been domesticated by us. Certain naturalists, indeed, assume that this has been the case. An attentive study of facts contradicts this assertion. The domestic animals appeared all together, contemporaneously, associated with a totally new civilization which arrived simultaneously. They were, then, imported, like the civilization which they accompanied. They were not, therefore, domesticated there as indigenous products, but foreign products introduced into the country by new arrivals, by invaders.

This general proof of the non-indigenous domestication is corroborated by the study of details. If, at the quaternary epoch, the horse, the ox, the goat were ancestral representatives in all France, it was not so with the sheep. In our quaternary deposits it has only occurred on the Mediterranean shore. It has been found in Hérault; it is abundant at Menton. This is evidently the northern limit of its habitat, and consequently this cannot be its place of domestication.

The fact is still more explicit as regards the pig. In the Robenhausian, or polished-stone epoch. we have recognized two species of domestic pigs in France, in Switzerland and in Italy. To the ordinary pig which originated from the wild boar, an animal abundant in our quaternary deposits, may be added the turf pig, very different, which has no other ancestor in the countries which I have just named. To learn where the domestic animals have come from, we should take into account the geographical area of their savage ancestral types. At the quaternary epoch the wild horse, identical with the domestic horse, was extremely abundant, not only in Western Europe but also in Asia Minor, on both slopes of the Caucasus and over all the basin of the Caspian sea. It extends still farther to the east. Its area of habitation traversed Europe and Asia.

The wild quaternary ox had a habitat a little less extended than the horse; nevertheless, like the latter, it extended from our region very far into Western Asia. Without speaking of the species with the hump, like the aurochs, there were two types of true oxen, the urus, of very great size, and another ox of much less size. Our domestic oxen certainly originated from one of these two types, perhaps from both.

The domestic goat may likewise have been derived from the bouquetin of the Alps and of Spain, as also from the *égagre*, the bouquetin of Crete, of Southern Caucasus, of Armenia and of Persia. Bouquetins and égagres breed spontaneously with the goat and produce very readily fertile hybrids, which proves that there exists between them strong bonds of parentage.

The sheep is a transformation of the mouflon of Corsica, of Sardinia, of Cyprus, which joins in the east, by Asia Minor, the argali sheep (mouflon) of Grand Tartary.

Finally, the ordinary pig is evidently a modified wild boar. Indeed, our pig set at liberty assumes the characters of the wild boar, and the latter, raised like our pigs, end by resembling them. Like the horse, or the ox, the wild boar ranges from Europe to Asia. Moreover, it is only in Asia that we find wild another swine, which is allied to the turf pig.

The only country containing all the ancestral types of domestic animals introduced into Western Europe at the Robenhausian epoch is that part of Asia which extends between the Mediterranean, the Grecian archipelago, the Black sea, Caucasus, the Caspian sea, the limits of Afghanistan, the north of Persia and Assyria. We should conclude that it is from that region that has proceeded the great wave of migration which has brought us, with the civilization of the polished stone epoch, our first domestic animals.

The study of cultivated plants confirms the facts deduced from the study of the animals. The invaders of the west of Europe, which at the Robenhausian epoch brought us the domestic animals, also introduced to us the three cereals, wheat, barley and rye. It is an agriculture transferred, transplanted all at once, and which consequently has not taken birth in our regions. The three cereals which I have just cited have had no ancestors among us. Among all the wild grasses, which have been well studied and are perfectly known, none approach the wheat, barley or rye. We are ignorant, it is true, of the ancestral forms of these three cereals, nevertheless, botanists are quite generally agreed that they came from the Caucasian regions. A certain fact, which militates in favor of this opinion, is, that the cereals named, whenever they have been cultivated in our fields, sometimes leave sporadic or spontaneous descendants; but they soon disappear at the end of two or three years and are no more to be seen. In the Caucasus, on the contrary, these sporadic and spontaneous individuals, escaped from cultivation, perpetuate themselves for a series of several years, besides that, they are generally more frequent. This proves that there they are nearer the place of origin, if that be not the place of origin itself.

With the wheat, barley and rye the Robenhausian invaders brought us a textile plant, of which they made great use, *i. e.*, flax. This plant is most useful in determining with precision the point of departure of the Robenhausian civilization. This civilization did not come from North-eastern Asia; for in China they have the hemp, a textile plant much more useful than flax; but the hemp was completely unknown in Western Europe during the entire polished stone epoch.

Flax also was very widely spread in ancient Egypt, to the exclusion of hemp. It can perhaps be inferred from this that the civilization which we have studied has come from Egypt, or at least from South-western Asia. To recognize the slight foundation of this assertion it suffices to return to the domestic animals. We have seen that the great migration of the Robenhausian or polished stone epoch brought us the domestic horse. However, the domestic horse, far from having originated in Egypt, was not introduced into that country until after the time of the pastoral kings, at the beginning of the eighteenth dynasty, in the eighteenth century before our era. The first domestic equid of Egypt was the ass, an animal of African origin. But the ass did not occur at all in Europe during the stone age. This absence of the ass, a very useful animal which lives very well in our climate, is also a proof that the civilization of the first great European migration did not come from South-western Asia, which has wild horses allied to the ass, such as the onager, which inhabits the shores of the Indus and extends to Southern Persia; or the hemione of Upper Asia and Mongolia. Everything in the study of the domestic animals and cultivated plants concurs, then, to prove that the first great migration which entered the south-west of Europe, at the Robenhausian epoch, came from Asia Minor, Armenia and the Caucasus. From our actual knowledge, we cannot establish whether this migration has followed the route of the land or even the course of the sea; but this much is certain, that in either case it reached us by the Mediterranean basin. If, without pastoral and agricultural facts, we seek proofs of this fact, we shall find in it the retrograde artistic movement, and in the introduction of architecture or the appearance of a monument, the *dolmen.*

The last populations of the geological periods, that of the Magdalenian epoch which terminated this period, had a very pronounced artistic sentiment. We have found in France, in Switzerland, in Belgium and in England, in the deposits of this epoch, true works of art. These are engravings and sculptures representing in a very natural manner, but very true and well studied, representations of animals.

But with the Robenhausian invasion this first start in art completely disappeared. We see no more ornamentation, or only rudiments exist, as in certain dolmens of the Mœbihan. These consist simply of fantastic combinations of different lines representing no living object. In the region whence the Robenhausian migration proceeded, we see certain peoples, as in Persia, who in decoration, still in our time, make only combinations of lines.

The first monuments, dolmens and menhirs, were brought to us by the Robenhausian migration. We find these monuments at the north and south of the region whence has started this migration. We have discovered dolmens in Palestine, especially among the Moabites; we have found them still more to the north of Asia Minor. On the other hand, it is well known that dolmens are found in the Caucasus, and that they pass into the Crimea.

Finally, at what date has the migration which we have just studied, taken place? Certainly it is very rash to seek the date, even approximate, of events so distant. However, it seems to me well to divert our researches in this direction; so without according them much importance, I proceed, finally, to present some considerations in this respect. It seems to me that we can affirm that the Robenhausian migration was anterior to the great Egyptian civilization. Indeed, the men comprising this migration did not know, for a long time, indeed a very long time, anything more than the use of stone. The Egyptian civilization, from the first dynasty, was in possession of metals. We submit that there were no relations between the Egyptians and the countries whence the emigrants departed, but it was not long before this relation was to be established, since from the fifth and the sixth dynasty Egypt had borrowed much from Asia, notably that which relates to the working of metals. The populations which invaded Europe had, therefore, already quitted Asia at this epoch.